

BAB VI

PERHITUNGAN BALOK B1

6.1 Properties Balok B1

Data - data : $b := 150 \text{ mm}$ Tulangan utama $\Phi 12 \text{ mm}$
 $h := 200 \text{ mm}$
 $d := h - (40 + 16 + 0.5 \cdot 12) = 138 \text{ mm}$
 $\text{daksen} := h - d = 62 \text{ mm}$
 $f_c := 18.675 \text{ Mpa}$ $\beta := 0.85$
 $f_y := 390 \text{ Mpa}$

$$\rho_b := 0.85 \cdot \beta \cdot \frac{f_c}{f_y} \cdot \left(\frac{600}{600 + f_y} \right) = 0.02$$

$$\rho_{\max} := 0.75 \rho_b = 0.016$$

$$\rho_{\min} := \frac{1.4}{f_y} = 0.0036$$

$$m := \frac{f_y}{0.85 \cdot f_c} = 24.57$$

Dari output ETABS didapat :

Mutump := 8.5615 kNm

Mulap := 7.3781 kNm

6.2 Perhitungan Tulangan Lentur Tumpuan

ambil $\delta := 0.4$

$$M_n := \frac{\text{Mutump} \cdot 10^6}{0.8} = 10701875 \text{ Nmm}$$

$$R_n := \frac{(1 - \delta) M_n}{b \cdot d^2} = 2.248 \text{ N/mm}^2$$

$$(\rho - \rho_{\text{paksen}}) := \frac{\left(1 - \sqrt{1 - \frac{2m \cdot R_n}{f_y}} \right)}{m} = 0.0062$$

$$\rho_{\text{paksen}} := \frac{\delta \cdot M_n}{f_y \cdot (d - \text{daksen}) \cdot b \cdot d} = 0.007$$

$$\rho := 0.0062 + 0.0070 = 0.0132 > \rho_{\min} = 0.0036$$

$$A_{\text{perlu}} := \rho \cdot b \cdot d = 273.24 \text{ mm}^2$$

$$A_s := 0.785 \cdot 14^2 \cdot 2 = 307.72 \text{ mm}^2$$

$$s1 := \frac{(150 - 80 - 16 - 2 \cdot 12)}{2 - 1} = 30 \text{ mm} \quad \blacksquare > \blacksquare \quad 25 \text{ mm} \quad \text{OK !!}$$

$$A_{s_{\text{aksenperlu}}} := \rho_{\text{aksen}} \cdot b \cdot d = 144.42 \text{ mm}^2$$

$$A_{st} := 0.785 \cdot 12^2 \cdot 2 = 226.08 \text{ mm}^2$$

pasang tul tarik 2Φ12 dan tulangan tekan 2Φ12

6.3 Perhitungan Tulangan Lentur Lapangan

$$\text{ambil } \delta := 0.4$$

$$M_n := \frac{M_{\text{lap}} \cdot 10^6}{0.8} = 9222625 \text{ Nmm}$$

$$R_n := \frac{(1 - \delta) M_n}{b \cdot d^2} = 1.94 \text{ N/mm}^2$$

$$(\rho - \rho_{\text{aksen}}) := \frac{\left(1 - \sqrt{1 - \frac{2m \cdot R_n}{f_y}}\right)}{m} = 0.0053$$

$$\rho_{\text{aksen}} := \frac{\delta \cdot M_n}{f_y \cdot (d - d_{\text{aksen}}) \cdot b \cdot d} = 0.006$$

$$\rho := 0.0053 + 0.0060 = 0.0113 \quad \blacksquare > \blacksquare \quad \rho_{\text{min}} = 0.0036$$

$$A_{s_{\text{perlu}}} := \rho \cdot b \cdot d = 233.91 \text{ mm}^2$$

$$A_s := 0.785 \cdot 12^2 \cdot 2 = 226.08 \text{ mm}^2$$

$$s1 := \frac{(150 - 80 - 16 - 2 \cdot 12)}{2 - 1} = 30 \text{ mm} \quad \blacksquare > \blacksquare \quad 25 \text{ mm} \quad \text{OK !!}$$

$$A_{s_{\text{aksenperlu}}} := \rho_{\text{aksen}} \cdot b \cdot d = 124.46 \text{ mm}^2$$

$$A_{st} := 0.785 \cdot 12^2 \cdot 2 = 226.08 \text{ mm}^2$$

pasang tul tarik 2Φ12 dan tulangan tekan 2Φ12

6.4 Perhitungan Tulangan Geser Balok

$$V_c := \frac{\sqrt{f_c} \cdot b \cdot d}{6} = 14909.03 \text{ N}$$

$$V_u := 19726 \text{ N}$$

$$V_c = 14909.03 \text{ N}$$

$$V_s := \frac{V_u}{0.75} - V_c = 11392.3 \text{ N} \quad \text{Perlu tulangan geser !!}$$

$$\text{Bila dipasang tulangan } \Phi 8 \text{ sebagai sengkang, } A_v := 2 \cdot 0.785 \cdot 8^2 = 100.48 \text{ mm}^2$$

$$f_y := 240 \text{ Mpa}$$

$$s_v := \frac{A_v \cdot f_y \cdot d}{V_s} = 292.12 \text{ mm}$$

sehingga dipakai tulangan geser tumpuan $\phi 8 - 150$ dan lapangan $\phi 8 - 200$